Washington Water Power Spokane River
Upper Falls Hydroelectric Development,
Gates and gate-lifting mechanisms
Spokane River, ca. 0.5 mile NE of intersection of Spokane Falls Blvd and Post Street
Spokane
Spokane County
Washington

HAER No. WA-162-B

HAER
WASH
32-SPOK,
5B-

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Columbia Cascades System Support Office
National Park Service
909 First Avenue
Seattle, Washington 98104-1060

HAER
WASH
32-SPOK,
5B-

HISTORIC AMERICAN ENGINEERING RECORD

WASHINGTON WATER POWER SPOKANE RIVER UPPER FALLS HYDROELECTRIC DEVELOPMENT,

GATES AND GATE LIFTING MECHANISMS

HAER No. WA-162-B

Location: Spokane River, ca. approx. ~~0.5~~ mile northeast of intersection of Spokane Falls Boulevard and Post Street, City of Spokane, Spokane County, Washington

U.S.G.S. 7.5 minute Spokane NW, Washington, quadrangle Universal Transverse Mercator coordinates: 11:468380.5278540

Date of Construction: 1921-1922

Engineer: V.H. Greisser, Chief Engineer, Washington Water Power Company

Builder: Washington Water Power

Present Owner: Washington Water Power
1411 East Mission
P.O. Box 3727
Spokane, WA 99220

Present Use: Water containment and control

Significance: Washington Water Power's (WWP) south channel dam, gate house, gates, and associated lifting mechanisms are the elements which control the flow of water from the south channel of the Spokane River into the penstock. The penstock is the pipe that provides hydraulic force to operate the single vertical shaft turbine-generator unit located in the Upper Falls Power Plant, located ca. 400. ft. below (north of) the south channel intake gates. The "curtain style" gates and gate-lifting mechanisms are the only gate style of this type utilized by WWP in any of its six hydroelectric developments on the Spokane River. The Upper Falls HED was determined eligible for listing in the National Register of Historic Places in 1988.

Report Prepared by: Robin Bruce
Director/Historian
Western Historical Services
731 Dundee Drive
Post Falls, Idaho 83854

Date: November 1998

I. INTRODUCTION:

During construction of Washington Water Power's (WWP) Upper Falls hydroelectric development (HED) in 1921-1922, WWP installed three "curtain type" head gates and associated lifting mechanisms in a gravity-flow dam, located on the south channel of the Spokane River. The gates, gate-lifting mechanisms, trash racks, and trash-raking equipment are located in the NE1/4, SW1/4, Section 18, T25N, R43EWM. The gates are located on what is known as the "Upper Falls" of the series of falls (upper, middle, and lower) that comprises Spokane Falls. Spokane Falls passes through the commercial core of the city of Spokane. Thus, the Upper Falls HED historically and presently has been highly visible to public view. These gates are the only curtain type gates in any of the WWP's six Spokane River HEDs. A small brick gate house covers the gates and protects the gate-lifting mechanisms. The Upper Falls HED, of which the south channel gates and lifting mechanisms are a part, was determined eligible for listing in the National Register of Historic Places in 1988.[1]

The Upper Falls HED is situated in Riverfront Park, which is the former site of the World Exposition held in Spokane, Washington, in 1974 (hereafter Expo 74). Riverfront Park lies adjacent to (north of) the city of Spokane's commercial core (see *Figure 1*, "Sketch Plan of Riverfront Park." page 14). The location of the Upper Falls HED and its main components are also identified in *Figure 1*. Because of age-related deterioration, WWP plans to replace the present gates with new steel vertical-lift gates. The gate-lifting mechanisms, trash racks, and trash-raking equipment will also be upgraded as a part of WWP's present project. WWP will not be modifying the power house or other structures or equipment as a part of the current upgrade efforts involving the Upper Falls HED.

II. DESIGN HISTORY OF CURTAIN TYPE GATES:

A European designer, M. Camere, invented the curtain type gate.[2] Gates of that design were first introduced in the Port Villez Dam (constructed 1876-1880) on the Seine River, a hydroelectric facility which was constructed ca. 90 miles below Paris, France.[3] As originally conceived, design of the curtain gate is described as follows:

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[1]Leonard Garfield, Architectural Historian, Office of Archaeology and Historic Preservation, Olympia, WA, in correspondence to the WWP, 29 June 1988.

[2]Edward Wegman, *The Design and construction of dams including masonry, earth, rock-fill, timber and Steel Structures also the principal types of movable dams* (New York: John Wiley & Sons, Inc., 1922), 316-319.

[3]Ibid.

> Each curtain consists of a number of horizontal wooden bars, which are fastened together on the up-stream side by two rows of bronze hinges. . . .The bars have the same length and height, but their thickness is increased from the top to the bottom, according to the pressure they have to sustain. A casting called the 'rolling-shoe' is attached to the bottom bar and forms the centre on which the curtain is rolled up. It rests on the floor when the curtain is down . . . .The weight of the 'rolling-shoe' is sufficient to make the curtain unroll easily when it is being lowered.
>
> The curtain is suspended by two chains which are fastened by hooks to the fixed parts of the dam, above the water. Each of these chains is attached to a ring bolted to the upper bar in the line of the hinges.[4]

As originally designed, the lifting mechanisms for the curtain gate are described as follows:

> The curtain is moved by means of a special windlass. . . which works an endless chain that passes around the curtain on its centre-line. The chain is prolonged above the curtain and is guided to the windlass by fixed pulleys. The windlass is arranged in such a manner that when the curtain is being rolled up, the up-stream part of the windlass-chain, which rises, travels faster than the downstream part, which is lowered. This difference of velocity causes the chain to slide under the shoe. The resulting friction added to the traction of the chain makes the shoe revolve, and thus rolls up the curtain. In unrolling the curtain the downstream part of the chain is made fast and the up-stream part is released.[5]

It is important to note that as originally designed, when curtain gates were lifted they rolled into a cylindrical bundle, not unlike the effect of peeling a can of anchovies open with a key. Once the curtains were in their rolled position, a crane mechanism lifted the gate and removed it from the dam: "After being taken out of the dam, the curtains [were] hung up to dry and cleaned."[6]

The curtain type gate offered several advantages over other gate designs. First, the curtains could be rolled to any desired height, with no problem of drift as the water was discharged from the bottom of the pool. The curtain gate also could be opened and closed more quickly than frame type gates. Last, an obvious advantage of the curtain type gate was its accessibility for cleaning and repair.[7]

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[4]Ibid., 318.

[5]Ibid.

[6]Ibid., 319.

[7]Ibid., 319-322.

The curtain gate design also held several disadvantages. First, the curtain gates had to be carefully hung, so there would be no lateral motion that could damage the gates during raising or lowering activities. Second, unlike other gate designs, when the curtain gates were rolled up there was no mechanism to prevent scouring of the riverbed. Last, as WWP discovered at the Upper Falls HED, the many wooden bars and their fastenings that formed the curtains offered numerous opportunities for leakage. This problem, to cite one instance, was addressed in 1981 following annual inspection of the Upper Falls curtain gates by WWP:

> The headgates are extremely difficult to seal. They are a hinged I beam type gate with a flat seal every 4" for 10' or more. The headgates are quite old and will be needing some major maintenance in the near future. Even if they are rebuilt, the sealing ability will not improve.[8]

III. DESCRIPTION OF THE UPPER FALLS GATES AND GATE LIFTING MECHANISMS AND DETAILS OF MODIFICATIONS TO THOSE STRUCTURES:

The three curtain gates in the Upper Falls HED cover bay openings of ca. 8 ft. x 14 ft.. (see photographs WA-162-B-6, WA-162-B-7, and WA-162-B-8). Photograph WA-162-B-10 shows the horizontal wooden bars and their fastenings typical of the curtain gate design. The hinge points for the gates are at the top of the openings (see photograph WA-162-B-10). They are "hung" from steel gate rails that are attached near the top of the south wall of the south channel dam and extend down to the riverbed. The gates are lifted with a 63 amperage electrically powered crane motor with accompanying solenoid brake, a unit which was manufactured by the General Electric Company, Schenectaty, NY (see photograph WA-162-B-2). The design for the lifting derrick for the gate-lifting mechanism is shown in photograph WA-162-B-13).

Design of the lifting apparatus, however, appeared to have been modified before the curtain gates became operational. The curtain gates were apparently installed in the gate openings some time in June of 1921. On 21 July 1921, in correspondence to S. E. Gates of the General Electric Company, WWP Chief Engineer for the Upper Falls HED, V. H. Greisser, placed an order for a "type CC - 2500 hoist motor 15 Horse Power, 575 R.P.M., 230 Volt together with contractor panel, limit switches and etc for operating on the gates at the head works."[9] In that correspondence, Greisser described the curtain gates, their lifting apparatus, and his expectations for their operation:

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[8][No first name given], Richardson, WWP, "Construction and Maintenance Department [report]," August 1981, in the Engineering Archives of the WWP, Spokane, WA.

[9]V. H. Greisser, WWP Chief Engineer, in correspondence to S.E. Gates of the General Electric Company, 23 July, 1921, in the Engineering Archives of the WWP, Spokane, WA.

> The gates are of the curtain type arranged in three sections. By means of clutches, it will be possible to raise or lower any one of the three sections or to lower all three sections at the same time. We do not anticipate any overhaul at the time of lowering the three gates together but are ordering the motor [referenced earlier] equipped with full torque shoe brakes to take care of the overhaul should there be any and to hold the gates in any position.[10]

Greisser went on to explain the electrical operation features of the gate-lifting mechanisms:

> A limit switch will be connected to each gate and interlocked with the clutch so that the operating coil in the contactor panel will be opened at either limit of travel of the gate. We propose using a double throw switch for reversing the series field on the motor and this switch will be operated manually. All operating of the gates will be done at the head works except a remote control station will be arranged for closing the gates only . . . .Then in case of emergency [the gates] can be closed by the switchboard operator.[11]

However, as finally installed, the curtain gates could not be opened simultaneously. The design for the lifting mechanism that WWP ultimately selected, which featured a detachable A-frame lifting derrick, could only open one gate at a time (see photograph WA-162-B-13). Whether or not this design change resulted from trial and error that may have shown flaws in the simultaneous gate-lifting system described by Greisser, or because cost may have been a factor, when the south channel headgates came on-line in 1922, the system opened only one gate at a time. Thus, closing the gates quickly in times of emergency was impossible. Over time, this original design system proved inadequate. In 1954, WWP altered the lifting mechanism to its present configuration. The description of those changes follows:

> With the old single temporary lifting tower arrangement two lifts had to be taken on each of the three gates. This made it impossible to close the gates quickly in case of emergency. With the new proposed set up all three gates can be closed in two or three minutes without changing the hook-up.
>
> The six sheaves with their concrete pedestals were first removed. The three towers, each fabricated in two sections by the Union Iron Works prints #E-12590-1 & 2 [prints not included as a part of this report] were set up, plumbed, and connected

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[10]Ibid.

[11]Ibid.

> with the braces which were welded to complete the assembly. Minor deviations from the prints were made. The old cables were too short for the new set up, so 130 ft. cables were cut and socketed; 780 ft. being required for the six cables on the three gates.
>
> The job will be completed when the roof hatch covers are rebuilt to fit the frames which extend above the roof.[12]

The cost for these upgrades was $1,991.54 in labor and $1,594.57 in material for a total of $3,586.11.[13]

These upgrades basically adhered to the original design concept of the gates and their lifting mechanisms and utilized most of the original structures. Original sheaves, for instance, were either retained or reused (see photograph WA-132-B-4), as were other structural and fastening components. Winches, pulleys and cables are used to lift the gates. Each gate is lifted simultaneously by a pair of 3/4" cables that are raised and lowered from cable spools bolted to the concrete flooring of the gate house. A portion of this lifting device is visible in (photograph WA-162-B-3), which shows one of the six spur gears, cable spools and shifting levers installed in the Upper Falls gate house. The cables pass over sheaves bolted to the steel superstructure of the lifting derrick. The sheaves are located directly above the gates inside of the gate house (see photographs WA-162-B-4- and WA-162-B-12). The cables lie inside of the gates' 70" guide rails. The cables are attached to the bottom of the gates. A 30" manhole, bearing the initials "WWP" is placed in the center of the gate house flooring (see photograph WA-162-B-5). It provides human access to the penstock.

The gate-lifting system utilized in the Upper Falls HED appears to have been an improvement over the original gate-lifting device designed by Camere. In fact, the Upper Falls gates do not roll at all, as in earlier versions of curtain type gates. Rather, the cables attached to the bottom of the gates allow rollers on the gates to fold around gate seats positioned at the bottom of each gate during the lifting process (see photograph WA-162-B-11). Thus, when fully opened, the gates are upright and vertical against the guide rails, with the wooden bar that forms the bottom of the curtain when the gate is closed, consequently positioned on top of the rail when the gates are open (see photograph WA-162-B-10). When fully opened, the bottom bars of the curtains are barely visible above the water surface of the forebay. During normal opening and closing gate-lifting activities, the curtain gates are never lifted completely out of the water, since cycling the wooden bars of the gates between wet and dry conditions is more harmful to the wood than keeping it constantly wet.

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[12]N. W. Humphrey, WWP, "Production Maintenance and Construction [report]," 26 July 1954, in the Engineering Archives of the WWP, Spokane, WA.

[13]Ibid.

The gate-lifting derricks installed in 1954 allow the gates to be lifted completely out of the water for repair and cleaning. This modification eliminated the need for divers to conduct underwater repairs to the gates, since all gate repairs and maintenance could then be performed above water. The present lifting system utilizes a pulley arrangement essentially the same in principal as the original movable gate-lifting device. Removable metal panels on the primary (south facade) of the gate house allow maintenance work to occur on both sides of the curtains (see photograph WA-162-B-1). When closed, the gates are protected with metal trash racks that will be replaced as a part of WWP's present upgrade project. The new trash racks will have a rack bar spacing of ca. 3," and, in appearance, will closely resemble the current racks.

It is unknown if the present trash racks are original; however, they were modified in 1969, when a new electrically powered trash cleaning device was installed (see photograph WA-162-B-1). At that time the entire rack section was tipped upstream to allow for the installation of a new steel frame behind the racks.[14] The new frame enabled the construction of an additional 20" (width) of walkway decking on the gate house, with that extension accommodating the new trash cleaning mechanism and the rails it traversed.[15]

IV. SITE SELECTION OF THE SOUTH CHANNEL DAM, GATES AND GATE-LIFTING MECHANISMS:

Construction of the Upper Falls HED fulfilled two primary concerns for WWP and their Spokane River HEDs. The first was WWP's commitment to expanding commercial sales. In 1906, WWP established its first commercial sales department. From that department, WWP salesmen went door-to-door in Spokane selling large appliances, such as electric ranges, hot water heaters, and refrigerators, and promoting smaller new and untried appliances such as toasters, percolators, and hot plates on a trial basis. WWP sold such things as signage to commercial customers as well. By 1920, WWP had more electric ranges on its system than any other utility in the United States.[16]

Hence, according to L. J. Pospisil, the WWP engineer in charge of structural and engineering work during construction of the Upper Falls HED, providing a "dependable source of a.c. energy for power" for commercial businesses and residences in the rapidly growing city of Spokane was of

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[14]Verne Sattler, WWP, "Mechanical/Structural Shop [report]," 1969, in the Engineering Archives of the WWP, Spokane, WA.

[15]Ibid.

[16]"Load Building," n.a., (WWP), in the Public Relations Vault, File FC1/1.19, WWP, Spokane, WA, circa 1926, n.p.

paramount importance.[17] Completion of the Upper Falls HED served this new thriving market, while power production and transmission systems from earlier Spokane River HEDs continued in their historic roles of extending WWP lines to new customers in rural eastern Washington State and in northern Idaho.[18]

Both because of the character of the Spokane River and of hydroelectric development that had occurred before construction of the Upper Falls HED, by the early 1920s, a "rare situation" had occurred in Spokane.[19] Namely, "a city of considerable size [had] been built up around a series of falls," where two plants, the Upper Falls HED (with an original nameplate rating of 10,000 Kw), and the earlier, and smaller, Monroe Street HED (constructed in 1889 and upgraded in 1903), produced considerable motive power, despite the fact that both plants had practically no storage capacity in their forebays.[20] This was because of WWP's construction (1906-1908) of the Post Falls HED on the Spokane River below the outlet of Lake Coeur d'Alene (located ca. 26 miles east of the Upper Falls HED) and the completion (ca. 1915) of the Long Lake HED (located ca. 25 miles west of the Upper Falls HED) on the Spokane River.

With completion of the Post Falls HED, Lake Coeur d'Alene (ca. 42 square miles in area), served as a natural holding reservoir for the entire Spokane River hydroelectric system. The Long Lake HED was the largest of the WWP's five hydroelectric facilities on the Spokane River.[21] That facility generated a capacity of 25,000 Kw (original nameplate capacity) and featured an impoundment storage capacity of 79,800 acre feet. Because of the excellent impoundment capacities of the Post Falls and Long Lake HEDs, those two facilities created a unique situation for the Upper Falls and Monroe Street HEDs:

> After the passing of the summer flood the gates at Post Falls, which control the level of Lake Coeur d'Alene, are closed and a practically uniform load is carried by the units in [the Upper Falls] station. Because of lack of storage in Spokane the uniform

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[17]L. J. Pospisil, "Upper Falls Development of the Washington Water Power Company in Spokane, Wash," *Journal of the American Institute of Electrical Engineers*, vol XLII, no. 11 (1923): 1134.

[18]"Load Building," circa 1926.

[19]L. J. Pospisil, "Upper Falls Development of the Washington Water Power Company in Spokane, Wash," 1134.

[20]Ibid.

[21]WWP, "Reclassification of Electric Plants" (1923): 235, Washington State University Archives and Special Collections, Pullman, WA., Box 2, Folder 23.

> flow released from the lake passes through unchanged to the forebay of the Long Lake station. This station [the Upper Falls HED] and the one immediately below it [the Monroe Street HED] take care of the daily variation in the load carried by the system.[22]

Because of fill resulting from bridge-building and other various construction, by 1920 the main branch of the south channel of the Spokane River had been completely filled.[23] The shaded area of *Figure 2,* "Historic Drawing of the Upper Falls HED [page 15]," shows the south channel area that had been filled by the time the Upper Falls HED was completed in 1922. This constriction of the flow of water over Spokane Falls posed an extremely serious risk for flooding. Stevens & Coons, consulting engineers hired by the WWP to study the "problem" prior to construction of the Upper Falls HED, summarized the accumulated effects of human engineering of the south channel over the years:

> Thus the south channel that probably carried 10,000 sec.-ft. or more during floods has its present discharging capacity reduced to 2,000 sec.-ft. or less. This forces all flood waters through the narrow throat in the North channel, and its capacity has been still further reduced by Washington Street arch and by the Great Northern Transfer Bridge.
>
> The combined effect of these encroachments has been to raise flood heights in the vicinity of Division Street about 3 feet. That is, if the flood of 1894 should recur today the water would stand three feet higher than it did in 1894 and would flood the Great Northern tracks and depot and make [Trent Avenue (now Spokane Falls Boulevard)] a veritable torrent.[24]

Channel improvements helped alleviate the threat of flooding. As a part of the channel improvements, a dam was constructed above the throat of the river that diverted the flow of water from the north channel of the Spokane River into the south channel during times of low water. The south channel head gate dam connected a reinforced concrete penstock 18 ft. in diameter and 370 ft. long to the powerhouse. During low water, the entire flow of the Spokane River passed through the penstock,

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[22]Pospisil, 1134.

[23]Stevens & Koons, Consulting Engineers (Report prepared for the WWP, Spokane, WA, 15 September 1921), "Report on the Dam and Channel Improvements Upper Spokane Falls Hydro-Electric Development of the Washington Water Power Co." (Report prepared for the WWP, Spokane, WA, 15 September 1921), 2, in the Public Relations Vault, File FC1/1/34, WWP, Spokane, WA, 2.

[24]Ibid., 2-3.

a structure described at the time of its construction as being "as large as a railroad tunnel [see photograph WA-162-B-9]."[25] The penstock followed one of the natural channels in the river that had been dammed by the Phoenix Sawmill and utilized by that company until construction commenced on the Upper Falls HED in 1921.

V. CONSTRUCTION HISTORY OF THE UPPER FALLS CURTAIN GATES:

The first substantive construction of the entire Upper Falls HED by WWP commenced with excavation work on the south channel. A description of the activities formed the entry, dated 11 January 1921, in the "Spokane Upper Falls Development Daily Progress Report":

> Dredging south channel and digging out anchorage for south end of cofferdam. Laying track [see photograph WA-162-B-6] for handling rock from penstock excavation to cofferdam. Tearing out bents that supported old shed which has been removed. . . . Permanent timbering under Phoenix platform started. Cutting off leakage from spillway with sand bags and tightening waste gates of [P]hoenix cut-off dam. Wiring complete under Phoenix platform. Ready for night shift on rock work Jan 12, P.M. Sawmill being erected.[26]

As the above quotation illustrates, because of the highly industrial nature of the site in the early 1920s, other nearby structures that were not under the ownership of WWP had to be considered in all construction work. For example, as the progress report for 15 January 1921 states, workers were "tightening the west bulkhead of [the] waste channel and placing permanent timbering beneath [the] waste channel and placing permanent timbering beneath [the] Phoenix [sawmill] platform."[27] Similarly, as excavation for the south channel intake and penstock proceeded, a steam-powered "donkey" assisted workmen in cleaning out the forebay and removing the water wheels from the Phoenix Mill (see photograph WA-162-B-7).[28] As was true for the entire Upper Falls HED project, excavation and construction work on the south channel improvements were labor intensive. By mid-February 1921, for example, 73 men worked on the day shift and 25 men worked on the night shift on multiple concurrent construction phases for the Upper Falls HED in order to maintain construction

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[25]"Put Spokane River Through a Pipe," 2 October 1921, Northwest Room, Spokane Public Library, Spokane, WA, Vertical File, "Washington Water Power Co. 1906-1959.

[26]W. A. Hill, "Spokane Upper Falls Development Daily Progress Reports," dated from 3 January 1921 to 8 February 1922, n.p., in the Public Relations Vault, File FC1 1.39, WWP, Spokane, WA.

[27]Ibid., 15 January 1921, n.p.

[28]Ibid., 10 February 1921, n.p.

schedules.[29] The labor force appeared to have been local. By 18 February 1921, crews were working on the intake forms for the south channel gate openings (see photograph WA-162-B-8). At the same time, other workers "finished stopping gates in old dam at Centennial Mill."[30]

Photographs WA-162-B-6 through WA-162-B-9) show the rapid construction progress on the south channel intakes, including the opening into the penstock. By 3 April 1921, the south channel dam's west wingwall had been poured and forms were under construction for the gate openings (see photograph WA-162-B-7). Later that month the concrete for the dam and intakes had been poured and the framework to support the trash racks had been erected (see photograph WA-162-B-8). The entire Upper Falls HED was completed in February of 1922, little more than one year following ground-breaking activity.

The Upper Falls HED was designed and constructed under the direction of V. H. Greisser, WWP Chief Engineer. He was assisted by WWP engineers, H.L. Melvin, who directed electrical installations and procedures, and L. J. Pospisil, who directed the mechanical and structural work for the project.[31]

Original costs for the headgates and lifting mechanisms follow:

1)	Headgate purchase	= $ 5,850.40
2)	Headgate installation	= 511.39
3)	Mechanism purchase	= 2,342.54
4)	Mechanism installation	= 2,963.80
5)	Electrical equipment (purchase and installation)	= 1,517.91
	TOTAL COST, gates in place	= $13,186.04[32]

In the years since installation of the curtain gates in the south channel dam, and excepting the modifications to the lifting mechanisms described in **SECTION III.** of this report, the curtain gates

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[29]Ibid.

[30]Ibid., 18 February 1921, n.p.

[31]Pospisil, 1140.

[32] The Washington Water Power Company (WWP), "Spokane Upper Falls Station-Costs," n.d., in the Engineering Archives of the WWP, Spokane, WA.

are essentially unaltered. They have played an important role in the containment works for the Upper Falls HED and for the operation of the entire Upper Falls HED since their installation in 1921.

VI. SOURCES:

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Greisser, V. H. Chief Engineer, Washington Water Power, Spokane, WA. Correspondence to S.E. Gates, General Electric Company, Spokane, WA, 1 July 1921. In the Engineering Archives, File "Generation: Upper Falls: Dam: Spillway: Rolling Sector: General."

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The Washington Water Power Company (WWP). "Reclassification of Electric Plants," 1923. Washington State University Archives and Special Collections, Pullman, WA., Box 2, Folder 23.

WWP. "Load Building." In the Public Relations Vault of the WWP, Spokane, WA, circa 1926.

WWP. "Spokane Upper Falls Station-Costs," n.d. In the Engineering Archives of the WWP, Spokane, WA.

VII. PROJECT INFORMATION:

This documentation has been prepared at the request of the WWP, which is planning to replace the original gates, gate-lifting mechanisms, trash racks and trash rake lifting mechanisms with new steel vertical-lift gates, gate-lifting mechanism, trash racks, and trash rake-lifting equipment. These upgrades are essential for the safe and efficient functioning of the south channel containment works. No modifications to any other components of the Upper Falls HED will occur as a part of the WWP's present upgrades (as discussed in the first section of this report).

The WWP has volunteered to participate in partial HAER recordation of the gates, gate-lifting mechanisms, and gate house. The partial recordation effort is not a part of Federal review requested under Section 106 of the National Historic Preservation Act of 1966, as amended. The WWP proceeded with partial HAER recordation of the Upper Falls HED because of their commitment to preserving a written and photographic record of character-defining features (the gates, gate-lifting mechanism, and gate house) of a NRHP-eligible property that will be altered as a part of their present proposed upgrades to the Upper Falls HED. The south channel Upper Falls curtain type gates and their lifting mechanisms are the subject of this partial HAER recordation effort.

Project Manager and Principal Investigator for partial HAER recordation of the Upper Falls HED was Robin Bruce of Western Historical Services, Post Falls, Idaho. Dr. Harvey S. "Pete" Rice of Colfax, Washington, conducted photographic documentation for the project. Documentation provided in the recordation resulted principally from Ms. Bruce's research in various archives of the WWP, Spokane, WA, and other pertinent repositories and sources, field inspection of the Upper Falls gate house and associated structures, and interviews with knowledgeable informants.

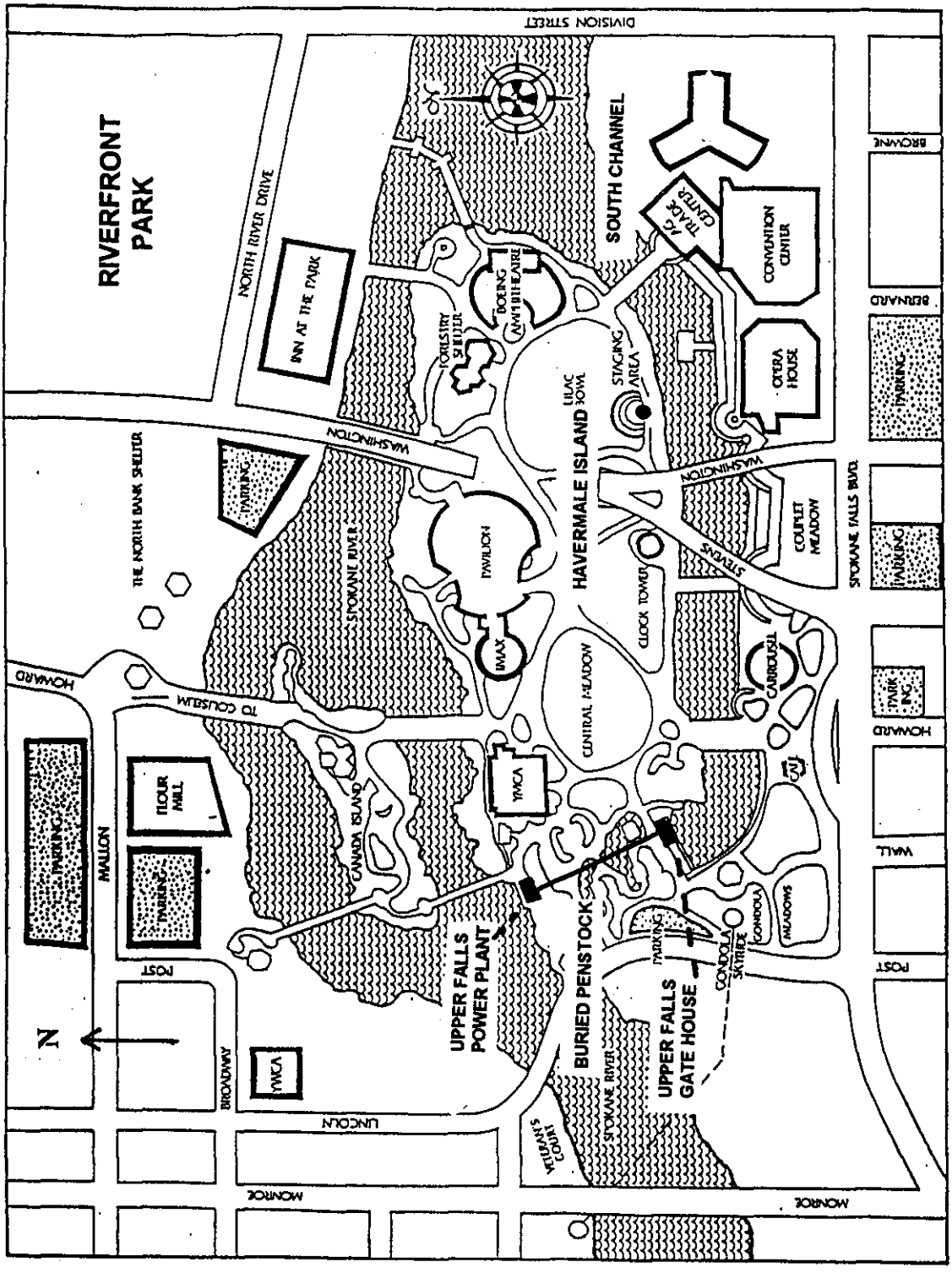

Figure 1, "Sketch Plan of Riverfront Park"

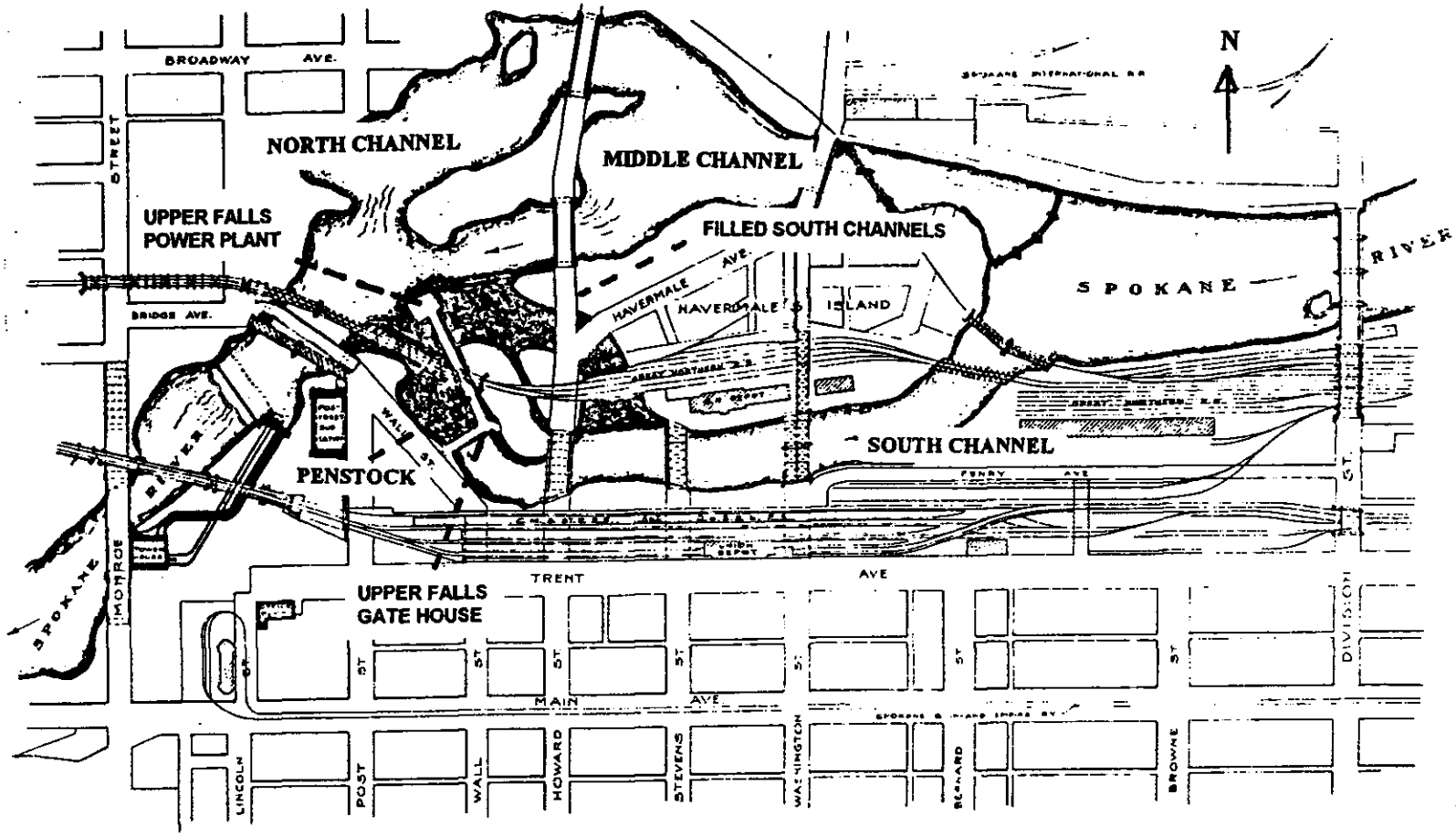

Figure 2, "Historic Drawing of the Upper Falls HED" *

*Adapted from a drawing prepared by Stevens & Coons, Consulting Engineers, Portland, Oregon, 15 September 1921, in a report for the WWP entitled "Report on the Dam and Channel Improvements Upper Spokane Falls Hydro-Electric Development of the Washington Water Power Co." (original report in the Public Relations Archives, WWP, Spokane, WA).